

Serial No.: 10/823,674
Docket No.: 102-1024
Amendment After Final dated October 29, 2010
Reply to the Final Office Action of September 1, 2010

Amendments to the Claims

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Previously Presented) A block-based motion compensation apparatus comprising:
 - a first motion compensation interpolator to read a first and a second pixel corresponding to a motion vector of an estimated current block respectively from a current and a previous frame or field inputted, and to calculate a first interpolation pixel;
 - at least one second motion compensation interpolator to read a third and a fourth pixel corresponding to a motion vector estimated with respect to each of at least one peripheral block adjacent to the current block to be interpolated respectively from the inputted current and previous frame or fields, and to calculate a second interpolation pixel;
 - a candidate interpolation pixel calculator to calculate a candidate interpolation pixel by allocating a predetermined weight to the first and the second interpolation pixels according to relative locations where the first and the second interpolation pixels are interpolated, among the current blocks to be interpolated;
 - a motion analyzer to analyze the estimated motion vectors of the current block and the peripheral blocks, and to determine whether the current block and the peripheral blocks are continuous; and
 - a final interpolation pixel selector to select one among the first interpolation pixel and the candidate interpolation pixel as a final interpolation pixel according to the result determined at the motion analyzer by comparing a deviation of the motion vectors of the current and the peripheral blocks, and to output the selected final interpolation pixel.
2. (Previously Presented) The motion compensation apparatus of claim 1, wherein when the deviation determined by the motion analyzer is equal to or larger than a preset threshold, the motion analyzer outputs a signal to the final interpolation pixel selector indicating to select the candidate interpolation pixel calculated from the candidate interpolation

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pixel calculator as a final interpolation pixel, and when the deviation is smaller than the preset threshold, , the motion analyzer outputs a signal indicating to select the first interpolation pixel calculated from the first motion compensation interpolator as a final interpolation pixel.

3. (Original) The motion compensation apparatus of claim 1, wherein the first and the second motion compensation interpolators respectively comprise:

a first pixel reader to read the first pixel corresponding to the motion vector of the current block from the inputted current frame or field;

a second pixel reader to read the second pixel corresponding to the motion vector of the current block from the inputted previous frame or field;

a first and a second multiplier to multiply a relative location correlation coefficient between the current and the previous frame or fields and the frame or field to be interpolated by the read first and second pixels, and to output the result as a first and a second multiplication data; and

a first adder to calculate the first interpolation pixel by adding the first and the second multiplication data outputted from the first and the second multipliers,

wherein the sum of the relative location correlation coefficients which are respectively provided to the first and the second pixels is 1.

4. (Original) The motion compensation apparatus of claim 3, wherein the relative position correlation coefficient is calculated by a following equation:

$$r = \frac{b}{a + b}$$

where, r is the relative location correlation coefficient multiplied by the second pixel, a is a minimum distance between the frame or field to be interpolated and the previous frame or field, and b is a minimum distance between the frame or field to be interpolated and the current frame or field.

5. (Original) The motion compensation apparatus of claim 1, wherein the candidate interpolation pixel calculator comprises:

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a weight storage part storing weights allocated with respect to the relative locations of the pixels for interpolation in the current block, the weight storage part to read and provide the weight corresponding to positions where the calculated first and second interpolation pixels are interpolated, among the allocated weights;

third and a fourth multiplier being provided with the weights corresponding to locations for interpolation of the first and the second interpolation pixels from the weight storage part, to multiply the weights by the first and the second interpolation pixels, and output as a third and a fourth multiplication data; and

a second adder to calculate the candidate interpolation pixel by adding the third and the fourth multiplication data outputted from the third and the fourth multipliers,

wherein the sum of the weights allocated to the first and the second interpolation pixels in the location where the first and second interpolation pixels are interpolated is 1.

6. (Original) The motion compensation apparatus of claim 5, wherein the weight allocated to the first interpolation pixel decreases, and the weight allocated to the second interpolation pixel increases as the location for the first and the second interpolation pixels shifts from the center toward the border of the interpolated block.

7. (Original) The motion compensation apparatus of claim 1, further comprising a delayer to delay the inputted current frame or field for a predetermined time, and to provide the delayed frame or field to the first and the second motion compensation interpolators and the motion compensation part.

8. (Original) The motion compensation apparatus of claim 1, wherein the number of the provided second motion compensation interpolator is identical to the number of the peripheral blocks.

9. (Previously Presented) A block-based method of motion compensation comprising:

reading a first and a second pixel corresponding to a motion vector of an estimated

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current block, respectively from a current and a previous frame or field, and calculating a first interpolation pixel with a first motion compensation interpolator;

reading a third and a fourth pixel corresponding to motion vectors estimated with respect to each of at least one peripheral block adjacent to the current block to be interpolated, respectively from the inputted current and previous frame or field, and calculating a second interpolation pixel with at least a second motion compensation interpolator;

calculating a candidate interpolation pixel by allocating a predetermined weight to the first and the second interpolation pixels according to relative locations where the first and the second interpolation pixels are interpolated among the current blocks to be interpolated with a candidate interpolation pixel calculator;

analyzing the estimated motion vectors of the current block and the peripheral blocks to determine whether the current block and the peripheral blocks are continuous with a motion analyzer; and

selecting among the first interpolation pixel and the candidate interpolation pixel as a final interpolation pixel according to the result determined in the determining operation of the motion analyzer that compares a deviation of the motion vectors of the current and peripheral block, and then outputting the selected final interpolation pixel with a final interpolation pixel selector.

10. (Previously Presented) The method of claim 9, wherein when the deviation determined by the motion analyzer is equal to or larger than a preset threshold, the motion analyzer outputs a signal to the final interpolation pixel selector indicating to select the candidate interpolation pixel calculated from the candidate interpolation pixel calculator as the final interpolation pixel, and when the deviation is smaller than the preset threshold, , the motion analyzer outputs a signal indicating to select the first interpolation pixel calculated from the first motion compensation interpolator as the final interpolation pixel.

11. (Original) The method of claim 9, wherein the first and the second interpolation pixel calculating operations respectively comprise:

reading the first pixel corresponding to the motion vector of the current block from the

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inputted current frame or field;

reading the second pixel corresponding to the motion vector of the current block from the inputted previous frame or field;

multiplying a relative location correlation coefficient between the current and the previous frame or fields and the frame or field to be interpolated by the read first and second pixels, and outputting the result as a first and a second multiplication data; and

calculating the first interpolation pixel by adding the first and the second multiplication data outputted from the first and the second multipliers,

wherein the sum of the relative location correlation coefficients which are respectively provided to the first and the second pixels is 1.

12. (Original) The method of claim 11, wherein the relative position correlation coefficient is calculated by a following equation:

$$r = \frac{b}{a + b},$$

where, r is the relative location correlation coefficient multiplied by the second pixel, a is a minimum distance between the frame or field to be interpolated and the previous frame or field, and b is a minimum distance between the frame or field to be interpolated and the current frame or field.

13. (Original) The method of claim 9, wherein the candidate interpolation pixel calculating operation comprises:

reading and providing the respective weights corresponding to positions where the calculated first and second interpolation pixels are interpolated, among the weights allocated according to relative locations of the pixels to be interpolated in the current blocks;

multiplying the weights by the first and the second interpolation pixels, and outputting the result as a third and a fourth multiplication data; and

calculating the candidate interpolation pixel by adding the outputted third and fourth multiplication data,

wherein the sum of the weights allocated to the first and the second interpolation pixels

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in the location where the first and second interpolation pixels are interpolated is 1.

14. (Original) The method of claim 13, wherein the weight allocated to the first interpolation pixel decreases and the weight allocated to the second interpolation pixel increases as the location for the first and the second interpolation pixels shifts from the center toward the border of the interpolated block.

15. (Original) The method of claim 9, further comprising delaying the inputted current frame or field for a predetermined time and then providing the delayed frame or field to the first and the second interpolation pixel calculating operation.

16. (Original) The method of claim 9, wherein the number of the provided second interpolation pixel is identical to the number of the peripheral blocks adjacent to the current block to be interpolated in the second interpolation pixel calculating operation.

17. (Currently Amended) A block-based method of motion compensation, comprising:

calculating a candidate interpolation pixel by allocating a predetermined weight to a first interpolation pixel and a second interpolation pixel according to relative locations where the first and the second interpolation pixels are interpolated among the current blocks to be interpolated; selecting areas of image blocks where block artifacts occur; and applying an overlap block motion compensation only to the selected areas, wherein the areas of the image blocks are discontinuous areas between blocks, and wherein the selecting of the discontinuous areas includes comparing a deviation between motion vectors of a current block and peripheral blocks, and outputting a final interpolation pixel.

18. (Currently Amended) The method of claim 17, wherein the overlap block motion compensation comprises:

reading a first and a second pixel corresponding to a motion vector of an estimated

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current block, respectively from a current and a previous frame or field, and calculating the first interpolation pixel;

reading a third and a fourth pixel corresponding to motion vectors estimated with respect to each of at least one peripheral block adjacent to the current block to be interpolated, respectively from the inputted current and previous frame or field, and calculating the second interpolation pixel;

determining whether the current block and the peripheral blocks are continuous; and

selecting among the first interpolation pixel and the candidate interpolation pixel as the final interpolation pixel to be used in the overlap block motion compensation according to the result determined in the determining operation, and then outputting the selected final interpolation pixel.

19. (Canceled)

20. (Canceled)

21. (Original) The method of claim 17, further comprising selectively applying the overlap block motion compensation to non-selected areas of the image blocks to reduce blurring.